Diatom distribution in North Pacific surface sediments and application for paleoceanographic reconstruction

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Diatom assemblages represent a useful tool to reconstruct Pleistocene paleoceanographic conditions in the subpolar North Pacific and its marginal seas. As a baseline for such studies we generated a new data set including the relative abundance pattern of diatom species preserved in a total of 423 surface sediments. This covers a broad range of environmental variables characteristic of the subpolar North Pacific, the Sea of Okhotsk and the Bering Sea between 30° and 70°N. The data set combines diatom counts from 264 sites presented by Sancetta (Deep-Sea Research, 28A, 1981) and from 159 new samples collected in the frame of the INOPEX, KALMAR and KOMEX projects as well as during Canadian expeditions. The abundance pattern of 38 diatom species and species groups was compared with 9 environmental variables, i.e. the summer sea surface temperature and salinity, annual surface nutrient concentration (nitrate, phosphate, silicon), summer and winter mixed layer depth and summer and winter sea ice concentrations. The Correspondence Canonical Analysis (CCA) indicates strongest correspondence with the pattern of summer sea surface temperature. A Q-mode factor analysis yields a three-factor model representing assemblages (factors) associated with cold, intermediate and warm water mass, respectively and accounting for 86.9% of the cumulative variance.

The data analysis was used to develop diatom and hydrographic reference data sets for the quantitative estimation of past surface water temperatures with statistical methods. First down-core results from the northwestern Pacific, which cover the past 160 ka, are presented.